

REMARKS

In response to the above-identified Office Action, Applicant amends the Application and seeks reconsideration thereof. In this response, Applicant amends Claims 1-3, 5-6, 8-9, 12, 14-21. Accordingly, Claims 1-21 are pending.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attachment is captioned "Version With Markings To Show Changes Made."

A. Specification

An Abstract of the disclosure has been added to the Application as required by 37 C.F.R. 1.72(b). The Abstract on a separate sheet may be placed between page 19, the last page of the Description in the Specification, and page 20, the first page of the Claims.

The Disclosure was objected to because there was a closed parenthetical element with no corresponding open parenthetical element. The closing parenthetical element on line 15 of page 1 of the Specification, has been deleted. This deletion will allow the number of opening parenthetical elements to equal the number of closing parenthetical elements in the paragraph.

B. Claims Objections

Claims 5 and 9-21 were objected to under 37 C.F.R. 1.75(c) as being in improper form due to multiple dependent claims depending on other multiple dependent claims. The cited claims have been amended to remove multiple dependencies on multiple dependent claims. Accordingly, Applicant respectfully submits that Claims 5 and 9-21 are open to further treatment on the merits.

C. Claims Rejected Under 35 U.S.C. § 112

The Office rejected Claims 1-21 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicant has amended the claims with the Office's rejection in mind.

The Office rejected Claim 1, at line 1, the term "the vapor deposition" for lacking antecedent basis. The Applicant amends the claim to read "process for a chemical vapor deposition". Applicant has amended Claim 6 similarly.

The Office rejected Claim 1, at lines 1-2, noting that the claimed invention is directed to a process for the vapor deposition of layers. However, the Office stated there is not a recitation of the deposition step in the instant claim. The Applicant has amended the claim to include "a step of depositing the compounds on the substrate, the compounds coming from the flow of gas."

In Claim 1, lines 5-6, and Claim 6, line 7, the Office rejected the phrase "and swept by the gaseous compound" as being unclear. Applicant has amended the phrase to read "in which are flowing gaseous compounds." Applicant respectfully submits that this amendment in Claims 1 and 6 makes the claim clear.

The Office rejected Claim 1, at line 6, because the term "the gaseous compounds" lacked antecedent basis. The Office stated that this rejection applied to Claim 6 as well. Applicant respectfully submits the amendments previously made to the claims provides antecedent basis.

The Office rejected Claim 2 as requiring clarification and amendment to more fully describe the limitations of the heat shield around the first heating means. Applicant has amended Claim 2 to include the limitation "this at least one heat shield being concentric with respect to the duct and situated outside the first and second heating means." Applicant respectfully submits this amendment fully describes the

limitations cited. This amendment is not new matter as the heat shield described is supported in the Specification at page 13, lines 31-37.

The Office rejected Claim 8 at line 1 for having wording that is confusing and appeared to be unacceptable in a multiple dependent claim. The multiple dependency of the claim has been eliminated by the amendment which cites "a reactor according to Claim 6."

D. Claims Rejected Under 35 U.S.C. § 103

The Office rejected Claims 1-4 and 6-8 under 35 U.S.C. § 103(a) as being unpatentable over Tanaka (hereinafter "Tanaka"), U.S. Patent No. 5,020,474 or Ohkase (hereinafter "Ohkase"), U.S. Patent No. 5,443,648. The Applicant respectfully disagrees.

In order to render a claim obvious, the relied upon references must teach or suggest every limitation of the claim such that the invention as a whole would have been obvious at the time the invention was made to one skilled in the art. Claims 1 and 6 each recite "heating a substrate (10) by virtue of the radiation from the heat of the duct (6), which is itself heated by the first (8) and the second (9) heating means."

In making the rejection, the Office relies on Tanaka to disclose a vapor phase epitaxial growth reactor in which there is a reactor tube 1 located between a substrate 4 and heating elements 5 (col. 4, lines 4-24). However, the Applicant respectfully submits in Tanaka the substrate 4 is floating on a melt 9 (see Figs. 1-4). It is the melt 9 that heats the substrate 4 (col. 4, lines 36-37). Therefore, the bottom surface of substrate 4 is hotter than the upper surface. The temperature gradient is always in the same direction (from up to down). Tanaka fails to disclose a first and second heating means located on either side of the plane of the substrate. Tanaka discloses a single heating means that appears to be both above and below the plane of the substrate. However, in Tanaka, the heating means heats the melt on which the wafer is suspended. The failure of Tanaka to disclose

and first heating means and a second heating means located on either side of the plane of the substrate is fatal to the asserted rejection.

In making the rejection, the Office relies on Ohkase to disclose a vertical heat treatment in which a substrate is placed within a process tube (col. 3, lines 50-68). The Office further states heater units 21 and 23 are located above and below the substrate plane, respectively, as well as outside the process tube (see Fig. 1). The process tube can be made of quartz (col. 3, lines 63-64).

In Ohkase, the deposition chamber is divided into three parts, A, B, and C. Part A is the high temperature heating part (col. 6, lines 26-27). Part A preheats the substrate or wafer W.

Part B corresponds to the treating position, that is to say the deposition part. Heat in this part is obtained by heater unit 22 which is around the periphery of the processing vessel 11. When the substrate is coming up, the temperature of this part is quite high so as to preheat the wafer but afterwards, the temperature drops so as to be maintained at the treating temperature (col. 8, lines 59-65).

The temperature in Part C is obtained by the third heater unit 23 which is around the periphery of the processing vessel 11. Heater unit 23 has the same behavior as the second heater unit 22 and plays the role of a heat-retaining component. During the deposition, the temperatures in Parts B and C are the same (col. 8, line 65 through col. 9, line 2). The apparatus is not designed to create a temperature gradient through the substrate.

Moreover, even if such a gradient had to be created, the location of heater units 22 and 23 on the periphery of processing vessel 11 at the level of the substrate during the deposition phase, would not create a temperature gradient perpendicular to the plane of the substrate. The Applicant would like to emphasize that these heating units 22 and 23 are not able to uniformly heat a wafer such that it has zero gradient radially. Furthermore, the Applicant submits the upper heating means 21 has no opposite

component below the plane of the substrate, and the gradient possibly created by heating means 21 cannot be controlled or reversed.

Thus, Ohkase fails to disclose a first and second heating means located on either side of the plane of the substrate.

Tanaka fails to teach, suggest, or motivate toward a heating means located on either side of the plane of the substrate. Tanaka teaches away from having a first and second heating means by having a single heating means radially surrounding a melt which is supporting the wafer. This single heating means combined with the melt produces a temperature gradient that can only have one direction. Ohkase fails to cure the deficiencies of Tanaka. Ohkase provides an overhead heating element combined with two radial heating elements. The combination of Tanaka and Ohkase fails to teach, suggest, or motivate towards a first and second heating means located on either side of the plane of the substrate. Accordingly, Applicant respectfully requests withdrawal of rejection of Claims 1 and 6.

Claims 3 and 4 depend on Claim 1 and Claims 7 and 8 depend on Claim 6. As such, the dependent claims contain all of the limitations of their respective independent claims. Therefore, Applicant respectfully request the rejection of Claims 2-4 and 7-8 under 35 U.S.C. § 103(a) as being obvious over Tanaka in view of Ohkase be withdrawn for at least the same reasons given above for their base claims.

CONCLUSION

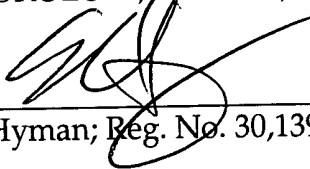
In view of the foregoing, it is believed that all claims now pending (1) are in proper form, (2) are neither obvious nor anticipated by the relied upon art of record, and (3) are in condition for allowance. A Notice of Allowance is earnestly solicited at the earliest possible date. If the Examiner believes that a telephone conference would be useful in moving the application forward to allowance, the Examiner is encouraged to contact the undersigned at (310) 207-3800. If necessary, the Commissioner is hereby

authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly, extensions of time fees.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR, & ZAFMAN LLP

Dated: 11/26/01

By: 

Eric S. Hyman; Reg. No. 30,139

CERTIFICATE OF MAILING:

I hereby certify that this correspondence is being deposited as First Class Mail with the United States Postal Service in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on November 21, 2001.

 November 26, 2001
Nadya Gordon Date

12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025
(310) 207-3800

Attachment: VERSION WITH MARKINGS TO SHOW CHANGES MADE

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IN THE SPECIFICATION

The paragraph on page 1, line 12, beginning with "Many devices are already known", has been amended as follows:

Many devices are already known for depositing layers on substrates by so-called CVD (Chemical Vapor Deposition) or MOCVD (Metal Organic Chemical Vapor Deposition), i.e. when one or more precursors are present in the form of organometallic compounds) methods.

IN THE CLAIMS

The claims have been amended as follows.

- 1 1. (Amended) Process for ~~the-a chemical~~ vapor deposition of layers of a material
- 2 on a substrate (10) which extends generally in a plane, characterized in that it comprises:
- 3 a step consisting in placing the substrate (10) in a duct (6) made of a refractory
- 4 material ~~and swept by them which are flowing~~ gaseous compounds necessary for the
- 5 deposition, this duct (6) being interposed between the substrate (10) and first (8) and
- 6 second (9) heating means located on either side of the plane of the substrate (10); ~~and~~
- 7 a step consisting in heating the substrate (10) by virtue of the radiation from the
- 8 heat of the duct (6), which is itself heated by the first (8) and second (9) heating means;
- 9 and
- 10 a step of depositing the compounds on the substrate, the compounds coming
- 11 from the flow of gas.

1 2. (Amended) Process according to claim 1, characterized in that it comprises a
2 step consisting in placing at least one heat shield (14, 15) around the first (8) and second
3 (9) heating means, this at least one heat shield being concentric with respect to the duct
4 and situated outside the first and second heating means.

1 3. (Amended) Process according to ~~one of the preceding claims~~claim 1,
2 characterized in that it comprises a step consisting in generating a temperature gradient
3 perpendicular to the plane of the substrate (10) and oriented in a first direction.

1 5. (Amended) Process according to ~~one of the preceding claims~~claim 1,
2 characterized in that it comprises a step consisting in creating a flow of a gas which is
3 inert with respect to all of the materials included in the reactor and with respect to the
4 material to be deposited and to the gases flowing in the duct (6).

1 6. (Amended) Reactor for ~~the~~a chemical vapor deposition of layers of a material
2 on a substrate (10) which extends mainly in a plane, comprising first (8) and second (9)
3 heating means located on either side of the plane of the substrate (10), characterized in
4 that it furthermore comprises a duct (6), made of a refractory material ~~and swept by~~
5 thein which are flowing gaseous compounds necessary for the deposition, this duct (6)
6 being interposed between the substrate (10) and the first (8) and second (9) heating
7 means.

1 8. (Amended) Reactor according to ~~either of claims 6 and 7~~claim 6, characterized
2 in that the duct (6) has a rectangular cross section and comprises two plates forming
3 lower (37) and upper (38) walls which are horizontal and parallel to the plane of the
4 substrate (10) in the position that it occupies during the deposition.

1 9. (Amended) Reactor according to ~~one of claims 6 to 8~~claim 6, characterized in
2 that it comprises at least one heat shield (14, 15) around the first (8) and second (9)
3 heating means.

1 12. (Amended) Reactor according to ~~either of claims 10 and 11~~claim 10,
2 characterized in that gas may be made to pass via the outlet of the duct (6) between the
3 internal space of the duct (6) and the space lying between the duct (6) and the tube (3),
4 so as to balance the pressure on the walls (37, 38, 39, 40) of the duct (6).

1 14. (Amended) Reactor according to ~~one of claims 8 to 13~~claim 8, characterized in
2 that the first (8) and second (9) heating means consist of a graphite strip or band placed
3 flat, parallel to the lower (37) and upper (38) walls of the duct (6), in a suitable geometry
4 so that, in the deposition zone, the deviations from the mean temperature on that
5 surface of the substrate (10) which is intended for the deposition are less than 3°C.

1 15. (Amended) Reactor according to ~~one of claims 8 to 14~~claim 8, characterized in
2 that the first (8) and second (9) heating means are positioned, outside the duct (6) each
3 at a distance of 1 to 3 mm from one of the lower (37) or upper (38) walls, respectively.

1 16. (Amended) Reactor according to ~~one of claims 6 to 15~~claim 6, characterized in
2 that the first (8) and second (9) heating means may be raised to different temperatures.

1 17. (Amended) Reactor according to ~~one of claims 6 to 16~~claim 6, characterized in
2 that the first (8) and second (9) means form only a single heating device placed all
3 around the duct (6).

1 18. (Amended) Reactor according to ~~one of claims 6 to 17~~claim 6, characterized in
2 that the first (8) and second (9) heating means are placed in the region of the deposition
3 zone.

1 19. (Amended) Reactor according to ~~one of claims 6 to 18~~claim 6, characterized in
2 that the heating means (8, 9) are supplied with a voltage of less than or equal to 230
3 volts.

1 20. (Amended) Reactor according to ~~one of claims 6 to 19~~claim 6, characterized in
2 that the duct (6) is internally lined, in the hottest parts, continuously with a secondary
3 duct made of refractory material.

1 21. (Amended) Reactor according to ~~one of claims 6 to 20~~claim 6, characterized in
2 that the first (8) and second (9) heating means are offset with respect to each other in
3 the longitudinal direction of the duct (6).